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ERTS DETAILED IMAGE INTERPRETATION REPORT

CRINC DIIR No. 2265-1
Date Prepared 27 Jan 73

Subject:

Change in Surficial Water Area, Quivera National Wildlife Refuge, Stafford County, Kansas

Subject Geographic Coordinates 38° 10N/98°35W

NASA Test Site No. NA

NASA Image Descriptors:

Water, Marsh

Report Summary: MSS-7 images acquired in August, October and December 1972 reveal changes in both the number of water pools and surficial water area of larger pools at Quivera National Wildlife Refuge (Big and Little Salt Marsh), Stafford County, Kansas.

Imagery References

CRINC Image No.	NASA Image ID Block	Subject Image Coordinates X	Y	Cloud Cover	Image Quality
MP00142	E-1023-16451-6(9.5)	102	120	10%	Poor
MP00295	E-1095-16454-7(9.5)	100	160	0%	Good
MP00568	E-1131-16460-7(9.5)	104	164	0%	Good

Map References:

USGS NJ14-5, scale 1:250,000

Digital Data Used Yes ___ No x

Image Analyst J.C. Coiner, D.L. Williams

Principal Investigator H.L. Yarger

NASA Contract No. NAS5-21822 MMC#060-III

User ID No. S045

REPORT

The Quivera National Wildlife Refuge is located in west-central Kansas in a depression surrounded by sand hills south of the Arkansas River. Two main pools, Big and Little Salt Marsh, are the largest water bodies of the complex, and are normally permanent. However, numerous intermittent water pools (man made and natural) exist in the refuge. Both the amount of surficial water and the number of pools are closely related to the suitability of the refuge for water fowl resting during spring and fall migration. This interpretation reports on changes in water bodies observed on ERTS-1 infrared imagery over a five month period from August to December 1972.

Three ERTS images dated 15 August (MSS-6), 26 October (MSS-7), and 1 December (MSS-7) were interpreted to determine the following:

1) change in the number of water bodies
2) change in the surficial water area of Big and Little Salt Marsh, and
3) change in the total surficial water area within the wildlife refuge.

On 15 August 1972, 21 individual water bodies greater than 4.047 hectares (ha)[1] could be identified on the MSS-6 image. The number of water bodies increased on both the October and December imagery to 32 and 47 respectively (see Table 1).

The surficial water area of the permanent water bodies increased a total of 1.91 km^2 from August to December, with Big Salt Marsh increasing 1.47 km^2 and Little Salt Marsh .44 km^2. In the same period, total water area in the refuge increased 8.42 km^2 from 7.61 km^2 to 16.03 km^2 (Table 1).

The rate of change from coverage to coverage during the study period can also be calculated for the permanent water bodies and the total water area (Table 2). These data reveal that the rate of change for the surficial water area of the permanent and ephemeral water bodies may have independent patterns. The total water area tended to increase before there was a marked increase in the surface area of permanent water bodies. This demonstrates that expansion of ephemeral bodies occurred before marked surficial area change in the permanent water bodies. However, when a certain water area had been

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[1] Image interpretation tests conducted by the authors reveal that by using a 3.16x enlargement from a 9.5 in. transparency, water bodies as small as .5mmx.5mm can be identified with assurance and measured (see CRINC DIIR 2265-2).

reached, both the water area of the ephemerals and Big Salt Marsh expanded at about the same rate.

Continued temporal analysis of the changes in numbers and areas of small water bodies may provide a better understanding of their dynamics. This understanding has potential application to water fowl management.

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TABLE 1

Changes in Surficial Water:
Quivera National Wildlife Refuge,
August to December 1972

	15 August	28 October	1 December
Number of Water Bodies	21	32	47
Area of Major Water Bodies			
Big Salt Marsh	1.35km^2 ±.10km^2	1.81km^2 ±.05km^2	2.82km^2 ±.10km^2
Little Salt Marsh	2.69km^2 ±.13km^2	2.69km^2 ±.10km^2	3.13km^2 ±.08km^2
Area of All Water Bodies >4.047 ha ± 10%	761 ha (7.61km^2)	1192ha (11.92km^2)	1603 ha (16.03 km^2)

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TABLE 2

Rates of change per coverage cycle
for major permanent water bodies and ephemeral water bodies;
Quivera National Wildlife Refuge[1]

	Percent Change Surface Water Area		
	Aug. - Oct.(4 cycles)	Oct. - Dec. (2 cycles)	Aug. - Dec. (6 cycles)
Big Salt Marsh	9%	28%	18%
Little Salt Marsh	0%	8%	3%
Total Water Area	14%	17%	18%

[1] Cycle rates of change were determined as follows:

$$C_R = \frac{(A_n - A_1)}{A_1} \Big/ CY_{1,n}$$

where C_R = change rate

A = area at times 1 and n

CY = orbital cycles between times 1 and n